

no damper

(12) UK Patent Application (19) GB (11) 2 322 934 (13) A

(43) Date of A Publication 09.09.1998

(21) Application No 9804269.0

(22) Date of Filing 27.02.1998

(30) Priority Data

(31) 970919

(32) 04.03.1997

(33) FI

(71) Applicant(s)

Halton Oy

(Incorporated in Finland)

Teollisuustie 2-4, 47400 Kausala, Finland

(72) Inventor(s)

Heimo Ullmanen

Lasse Laurila

Reijo Villikka

(74) Agent and/or Address for Service

Haseltine Lake & Co

Imperial House, 15-19 Kingsway, LONDON,

WC2B 6UD, United Kingdom

(51) INT CL⁶

F24F 13/30

(52) UK CL (Edition P)

F4V VFYD VG202 V163

(56) Documents Cited

GB 2314921 A

GB 2166863 A

GB 2155616 A

GB 2124753 A

GB 1555563 A

EP 0488977 A2

(58) Field of Search

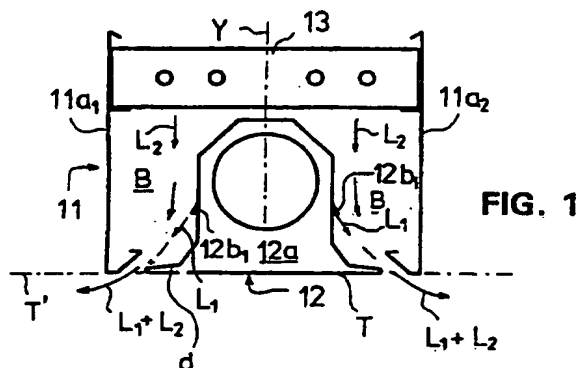
UK CL (Edition P) F4V VFYD VFYM VFYX

INT CL⁶ F24F 13/072 13/26 13/30

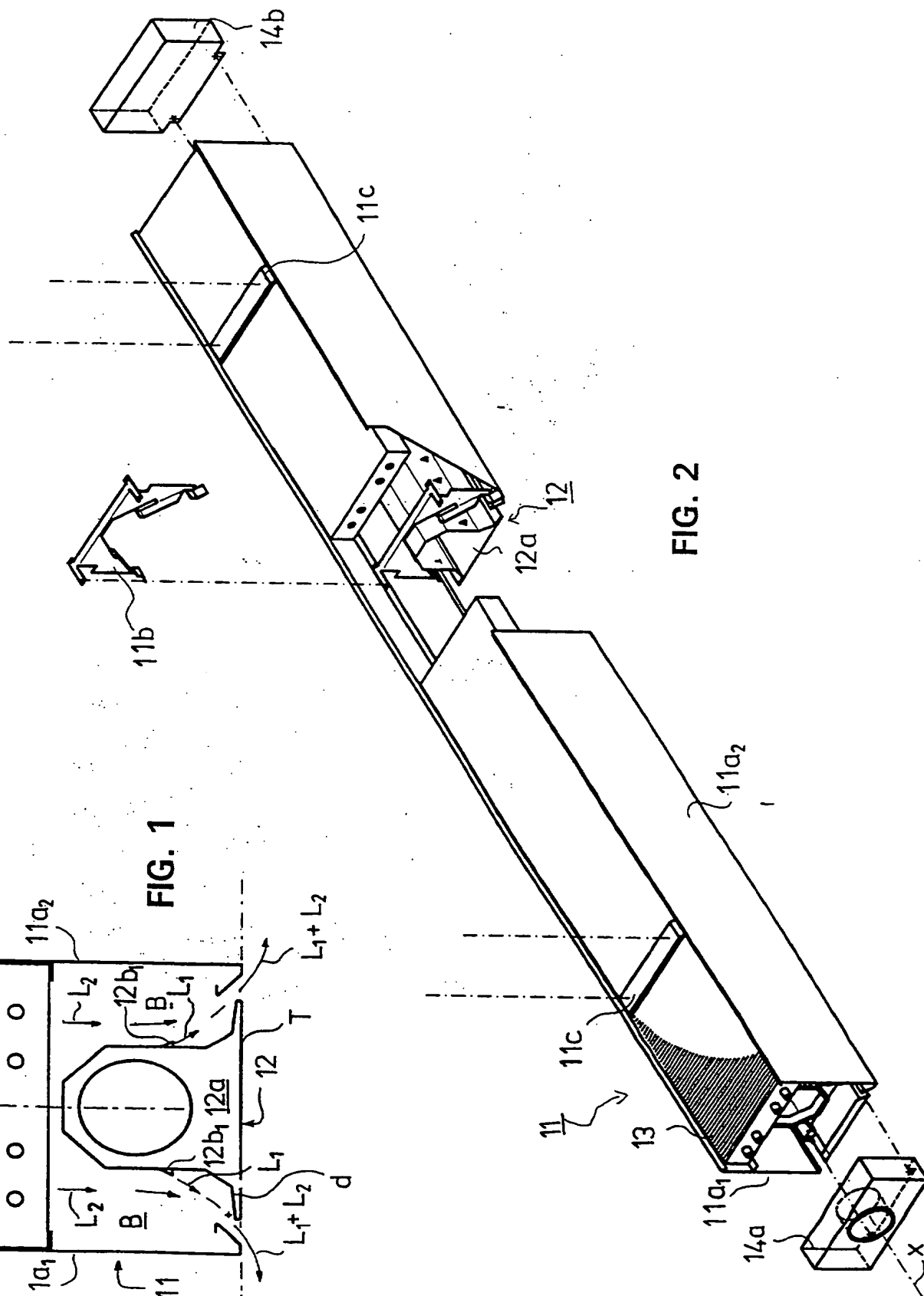
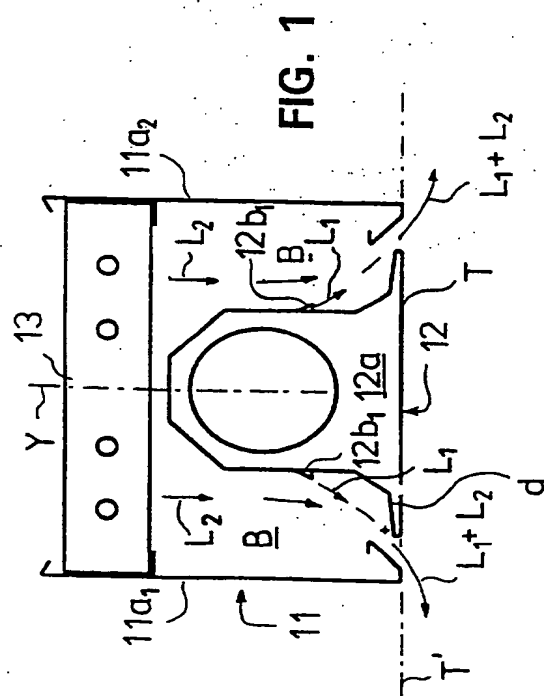
(54) Abstract Title

Intake air device

(57) The invention provides an intake air device (10) which comprises a first frame portion (11) having side walls (11a₁, 11a₂) and a heat exchanger (13) arranged between the side walls (11a₁, 11a₂). The device also comprises a second frame portion (12) having therein an air duct (12a) which has air discharge openings (12b₁, 12b₂, 12b₃...) in the side face thereof. The second frame portion (12), in use, is arranged in the space (B) between the side walls of the first frame portion such that intake air (L₁) flowing through the air discharge openings induces a flow of circulation air (L₂) through the heat exchanger (13), which circulation air is either heated or cooled by the heat exchanger. The second frame portion (12) is detachably secured to the first frame portion (11) such that the air duct (12) can be displaced partially or completely out of the space (B) between the side walls of the first frame portion (11), thereby allowing the air duct (12a) and the heat exchanger (13) to be cleaned at the same time.



GB 2 322 934 A



2/4

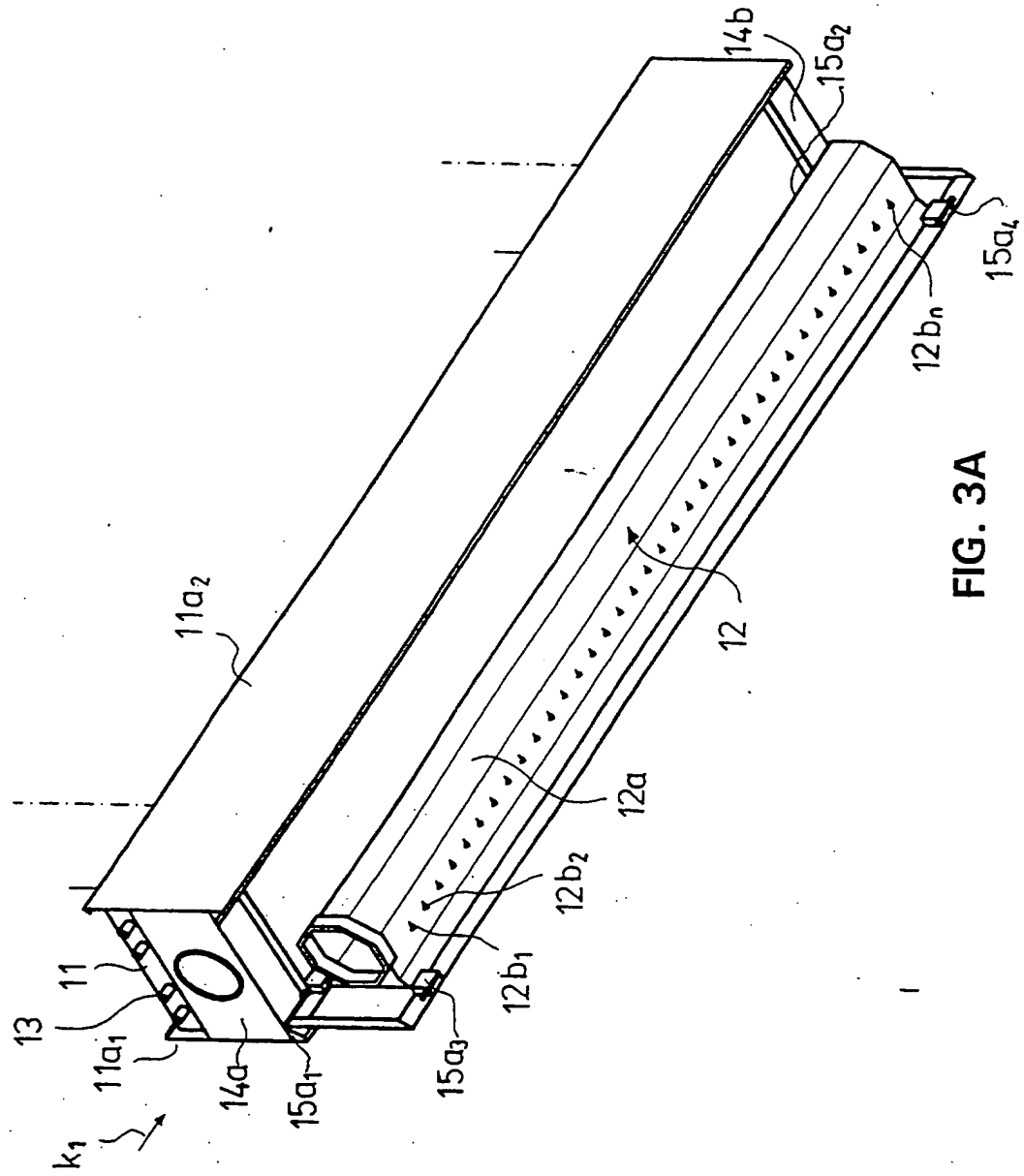


FIG. 3A

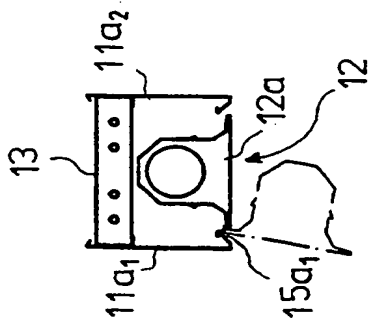


FIG. 3B

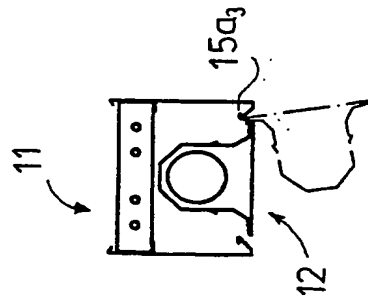


FIG. 3C

3/4

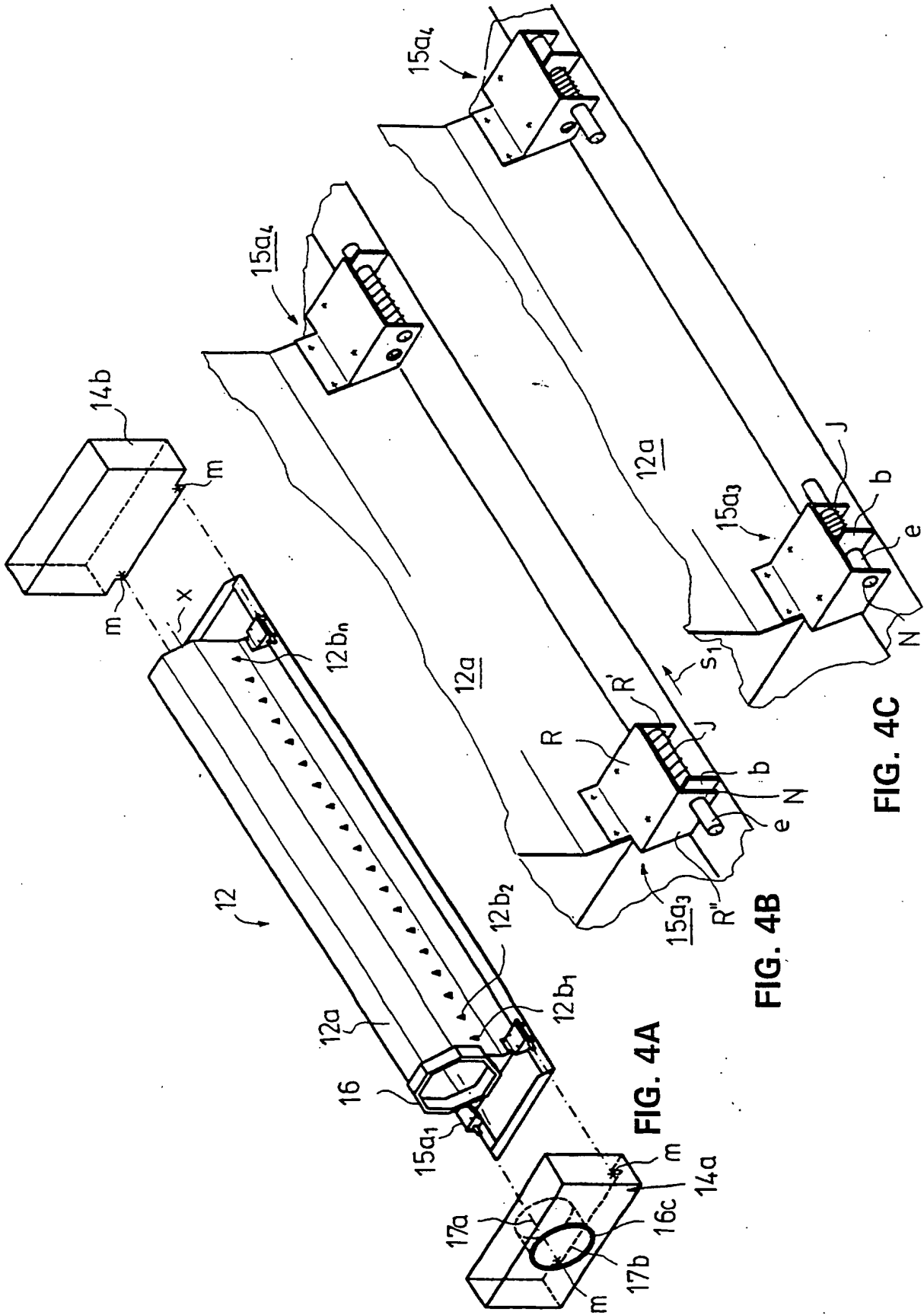


FIG. 4A

FIG. 4B

FIG. 4C

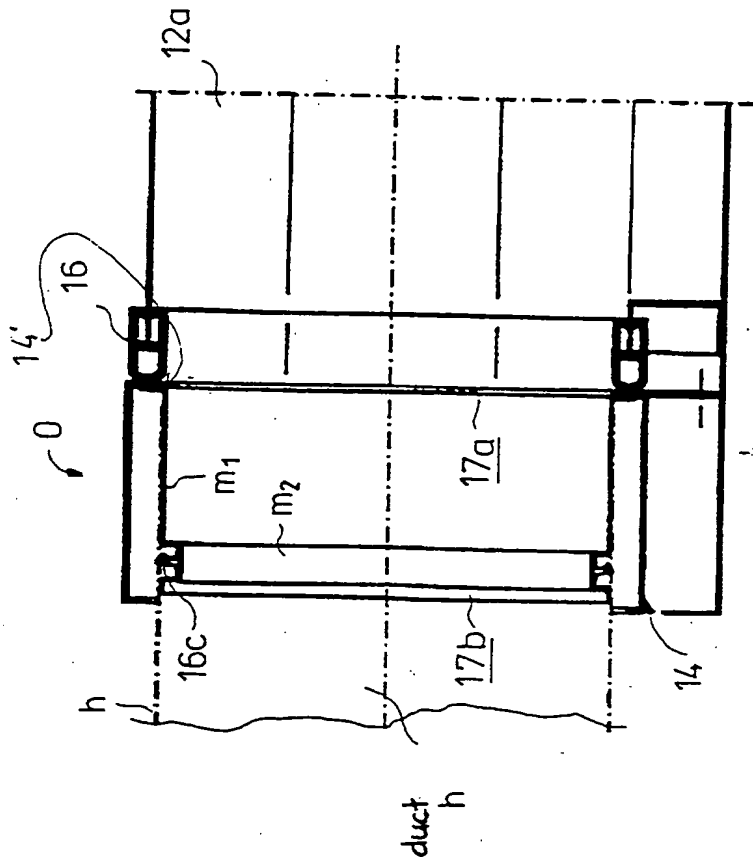


FIG. 5A

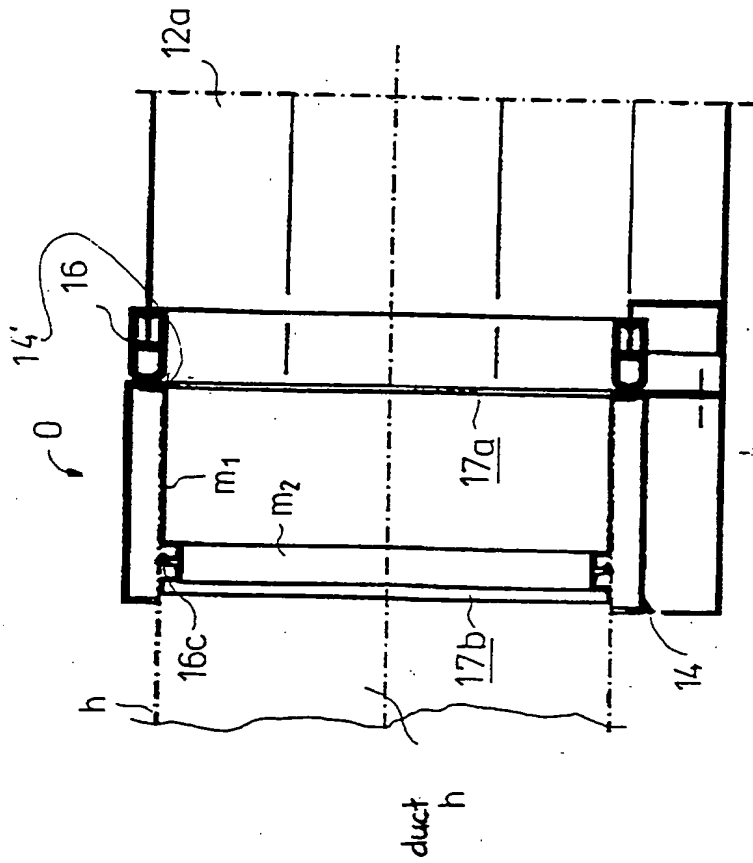


FIG. 5B

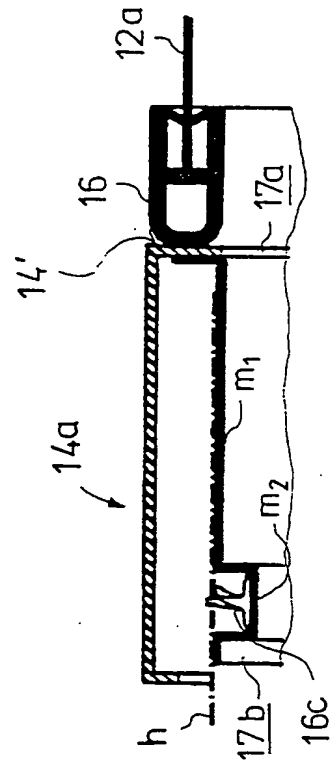


FIG. 5C

Intake air device

5

The invention concerns an intake air device, by whose means air is passed into a room space or equivalent and by whose means, also, air in the room is circulated through the heat exchanger of the intake air device in order to heat or to cool the circulation air.

10

From the applicant's **FI Patent Application No. 924330** of earlier date, an intake air device construction is known in which air is brought out of an air duct through air flow openings placed in the side faces of said air duct into a space, so-called side chamber, placed between the air duct and the side walls. The air is made to flow downwards in the side chamber, and the point of introduction of the air into the side chamber is preferably placed in the vicinity of the heat exchanger. The circulation air flows through the heat exchanger, which is placed in the top portion of the side chamber. The circulation air and the intake air are mixed in the side chamber, and the combined flow of air is directed towards the side out of connection with the device. The lowest face plane of the fresh-air intake duct in the device constitutes the lowest structural face in the device, and out of the side chamber the air flows towards the side in a direction parallel to the plane of said lowest face. Thus, the device in accordance with the invention can be placed directly in the vicinity of the ceiling so that its structures do not project from the level of the ceiling to a disturbing extent.

25

According to the present invention, there is provided an intake air device, comprising: a first frame portion having side walls and a heat exchanger arranged between the side walls; and a second frame portion having therein an air duct which has air discharge openings in the side face thereof and which, in use, is arranged in the space between the side walls of the first frame portion such that intake air flowing through the air discharge openings induces a flow of circulation air through the heat exchanger, which circulation air is either heated or cooled by the heat exchanger, wherein the second frame portion is detachably

30

secured to the first frame portion such that the air duct can be displaced partially or completely out of the space between the side walls of the first frame portion, thereby allowing access to both the air duct and the heat exchanger.

5 In the present invention, the air duct can be shifted into a cleaning position in relation to the first frame portion. Easy access is provided for cleaning of the fresh-air intake duct and the heat exchanger, and also the system of intake ducts for fresh air to which the device may, in some embodiments, be connected. Preferably, the air duct is supported by hinges and accordingly the device may further comprise hinge means for the second or duct frame portion
10 so that the duct frame can be pivoted away from the space between the side walls.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings, in which:-

15 Figure 1 is a sectional view of a device in accordance with the invention.

Figure 2 is an axonometric view of the device in accordance with the invention.

Figure 3A illustrates pivoting of the frame that comprises the fresh-air intake duct on
20 support of the hinges at one side.

Figure 3B shows the device as viewed in the direction of the arrow K_1 in Fig. 3A.

Figure 3C illustrates pivoting of the frame that comprises the fresh-air intake duct on
25 support of the hinges at the opposite side.

Figure 4A is a separate illustration of the hinge devices in connection with the frame part that comprises the fresh-air intake duct.

30 Figure 4B is an enlarged illustration of the hinge device at one side, which hinge device also operates as a locking device.

Figure 4C shows the hinge device of Fig. 4B with the locking opened.

Figure 5A is an axonometric view of an end piece.

5 Figure 5B is a sectional view taken along the line I-I in Fig. 5A.

Figure 5C shows the area O of Fig. 5B in an enlarged scale.

Fig. 1 is a sectional view of an intake air device 10 in accordance with the invention.
 10 The intake air device 10 comprises a first frame part 11, which includes side walls 11a₁ and 11a₂ and a connecting intermediate plate 11b as well as a heat exchanger 13 provided in the top portion between the side walls. As is shown in the figure, the equipment comprises a second, displaceable frame part 12, which comprises a duct 12a for fresh air. From the side face of the duct 12a, air discharge openings 12b₁,
 15 12b₂, 12b₃..., preferably nozzle constructions, are opened, through which fresh air (arrow L₁) is made to flow into the side chamber B placed between the side wall 11a₁ and the duct 12a. The construction is similar, preferably symmetric, in relation to the vertical axis and the central axis Y. The heat exchanger 13 is placed in the top portion of the chamber B. The chamber B is open at the top and at the bottom. The
 20 air discharge openings 12b₁, 12b₂... are preferably placed in the vicinity of the heat exchanger 13, preferably so that the air L₁ discharged through them is directed downwards and in the same direction as the circulation air flow L₂ which is passed through the heat exchanger 13 and enters from the heat exchanger into the chamber B. In such a case the flow losses remain little, and the flow L₁ induces the flow L₂
 25 through the heat exchanger 13 in the most efficient way.

The air flows L₁ and L₂ are combined in the chamber B, and the combined air flow L₁ + L₂ is made to flow towards the side by means of the inclined side wall portion d placed obliquely to the vertical axis Y below the duct 12a of the second frame part
 30 12. Thus, when the air is made to flow out of the structure (flow L₁ + L₂), it is directed towards the side and parallel to the ceiling face and in the plane T' of the bottom face T of the duct 12a.

Fig. 2 is an axonometric view of the device shown in Fig. 1A. The side walls 11a₁ and 11a₂ are interconnected by one or several intermediate plates 11b. The heat exchanger 13 is placed in the top portion of the construction between the side walls 11a₁ and 11a₂, and the device can be suspended on the ceiling proper by means of the suspension plate 11c placed between the side walls 11a₁ and 11a₂ and above the heat exchanger 13. At its end the duct 12a comprises a seal 16, which is placed against the end piece 14a fitted into the end space between the side walls 11a₁ and 11a₂ and the heat exchanger 13. The construction of the end piece 14a is illustrated separately in Fig. 5C. By means of the device in accordance with the invention and its heat exchanger 13, the circulation air L₂ in the room can be either cooled or heated. The end pieces 14a, 14b are fitted at the ends of the intake air device 10.

Fig. 3A shows the second frame part 12 in accordance with the invention as taken apart from the first frame part 11. The second frame part 12 has been pivoted on support of the hinge means 15a₁ and 15a₂ out of the space between the side walls 11a₁ and 11a₂, in which connection the second frame part and its duct 12a can be cleaned easily and in which connection, through the open construction thus formed, it is also possible to clean the heat exchanger 13 and the system of ducts (h) connected with the intake air device 10.

The device 10 ————— comprises hinges 15a₁, 15a₂; 15a₃ and 15a₄ at both sides of the longitudinal axis X of the duct 12a, which hinges also operate as locking means and preferably as so-called instant-locking means, by whose means the locking of the second frame part 12, i.e. of the so-called duct frame, in relation to the first frame part 11 can be opened freely, or by whose means the frame parts 11 and 12 can be locked quickly in relation to one another. In the embodiment shown in Fig. 3A, the hinges 15a₃ and 15a₄, which also operate as locking devices, have been released from locking, in which connection the duct 12a has been able to pivot freely to the cleaning position on the hinges 15a₁ and 15a₂.

Thus, ————— the hinge means 15a₁, 15a₂; 15a₃, 15a₄ operate as locking means and as hinge and articulation means.

The duct 12a comprises seals 16 at both ends. When the duct 12a is pivoted on support of the hinge devices to the upper position, the seals 16 become positioned around the flow opening 17a placed in the end pieces 14. The coupling between the seal 16 and the end piece 14a is a press fitting, in which connection the seal 16, which is a ring seal, is pressed tightly against the face 14' of the end piece 14.

Fig. 3B shows the construction as viewed in the direction of the arrow K_1 in Fig. 3A. As is shown in Fig. 3B, the second frame part, i.e. the duct frame 12, has been pivoted to the cleaning position on support of the hinge devices 15a₁ and 15a₂. The cleaning position is illustrated by means of dashed lines. The duct 12a rests on support of the hinge means 15a₁ and 15a₂. The hinge means 15a₃, 15a₄, which also operate as locking means, have been released from locking.

Fig. 3C illustrates alternative pivoting of the duct frame 12 on support of the opposite hinge devices 15a₃ and 15a₄, in which case the first hinge/locking means 15a₁ and 15a₂ have been released from locking. The cleaning position is illustrated by means of dashed lines.

Fig. 4A is a separate view illustrating the hinges/locking of the second frame part, i.e. the duct frame 12, in accordance with the invention. Fig. 4B is a separate illustration of the locking/hinge means 15a₃ and 15a₄. The hinge means 15a₃ and so also 15a₄ comprise a frame R and therein a displaceable hinge/locking pin e, which comprises a shifting lever b. A spring J is fitted around the hinge pin e so that it is fitted between the shifting lever b and the side wall R' of the frame R. Thus, in the state shown in the figure, when the pin e is not acted upon, the pin e is pressed by means of the spring force of the spring J to the projecting position shown in the figure. The Pin e passes through the hole N in the side face R'' of the frame. When the locking is released, the pin e is shifted by means of the shifting lever b against the spring force of the spring J in the direction S₁.

Fig. 4C shows the shifting of the pin e to the position of release of locking. When the locking is on (FIG. 4B), the pins e are in engagement with the backup holes m of the end pieces 14a and 14b attached to the first frame part 11 (FIG. 4A).

5 Fig. 5A is a separate illustration of the end piece 14a.

Fig. 5B is a sectional view taken along the line I-I in Fig. 5A. The figure also includes the end portion of the duct 12a. As is shown in the figure, the end seal 16 of the duct 12a is placed tightly against the side face 14' of the end piece 14a. As a
10 box-like frame part, the end piece 14a comprises an inlet opening 17b, to which the end of the duct h (illustrated by dashed-dotted lines) to be connected is brought. The other end piece 14b does not include flow openings 17a, 17b. At said side the duct 12a is closed.

15 Fig. 5C shows the area O in Fig. 5B in an enlarged scale. The duct h (illustrated by dashed-dotted lines) is attached to the part 14 by passing it through the inlet opening 17b in the frame of the box-like part 14 to the connecting projection m_1 of the conical end piece 14 around said projection. The seal 16c has been fitted into the seal groove m_2 on the connecting projection m_1 .

20 Thus, _____ instant-locking means are used which also constitute the hinge means $15a_1, 15a_2; 15a_3, 15a_4$. Thus, the hinge pin e of the hinge means also operates as the locking pin e of the instant-locking means. Thus, the hinge means $15a_1, 15a_2; 15a_3, 15a_4$ have two functions: besides as hinges in connection with
25 pivoting of the duct to the cleaning position, they also operate as locking means which keep said duct 12a in its place in the operating situation. The locking means are preferably so-called instant-locking means, and when all of them are opened, the second frame part 12, i.e. the duct 12a, can be removed completely out of connection with the device and with the first frame part 11, to be substituted for by a corresponding
30 part, e.g., in order to change the air flow properties, flow resistances, and equivalent.

CLAIMS:

1. An intake air device, comprising:
a first frame portion having side walls and a heat
exchanger arranged between the side walls; and
5 a second frame portion having therein an air duct
which has air discharge openings in the side face
thereof and which, in use, is arranged in the space
between the side walls of the first frame portion such
that intake air flowing through the air discharge
10 openings induces a flow of circulation air through the
heat exchanger, which circulation air is either heated
or cooled by the heat exchanger, -
wherein the second frame portion is detachably
secured to the first frame portion such that the air
15 duct can be displaced partially or completely out of
the space between the side walls of the first frame
portion, thereby allowing access to both the air duct
and the heat exchanger.
2. A device as claimed in claim 1, further
20 comprising latching means between the first frame
portion and the second frame portion, opening of the
latching means allowing the air duct to be displaced
partially or completely from the space between the side
walls of the first frame portion.
- 25 3. A device as claimed in claim 1 or claim 2,
further comprising hinge means on whose support the air
duct can be displaced so that it is displaced partially
or completely from the space between the side walls of
the first frame portion.
- 30 4. A device as claimed in claim 3 when appended
to claim 2, wherein the hinge means constitutes at
least a part of the latching means.
5. A device as claimed in claim 4, wherein the
hinge means comprises a pin which operates as a hinge
35 pin and a latching pin.
6. A device as claimed in claim 5, wherein the

the pin is arranged in a frame which is mounted on one of the first and second frame portions, the pin being (i) biased, by means of a spring, into a latching position in which a part of the pin is received in an opening in the other of the first and second frame portions, and (ii) movable, by means of a lever connected thereto, into an open position in which the part of the pin is not received in the opening,

7. A device as claimed in any preceding claim, further comprising an end piece at at least one end thereof, the end piece having an inlet opening in one side face thereof for receiving an air duct to be connected to the device and an opening in the other side face thereof which is surrounded by an end seal provided at the end of the air duct and press-fitted against the said other side face.

8. An intake air device substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

9. An intake air device (10), which comprises a first frame part (11) and therein side walls (11a₁,11a₂) and a heat exchanger (13) fitted between them, and the intake air device comprises a second frame part (12) and therein a duct (12a) for air, air discharge openings (12b₁,12b₂,12b₃...) being opened from the side face of said air duct (12a), in which connection, by means of the air that has been made to flow through the air discharge openings (12b₁,12b₂...), an air flow is induced through the heat exchanger (13), by means of which heat exchanger (13) circulation air (L₂) is either heated or cooled, and the heat exchanger (13) is placed in the top portion of the chamber (B) placed between the side wall (11a₁,11a₂) and the duct (12a), **characterized** in that said second frame part (12) of the intake air device (10), which frame part comprises a duct (12a) has been fitted detachably on the first frame part (11) in relation to its side walls (11a₁,11a₂) and to the heat exchanger (13) so that the duct (12a) can be displaced partly or completely out of the space between the side walls (11a₁,11a₂) of the first frame part (11) of the intake air device (10), in which connection, in the solution of equipment, the duct (12a) and the system of air ducts (h) connected with the device and the heat exchanger (13) connected with the device can be cleaned at the same time.

20

10. An intake air device as claimed in claim 9, **characterized** in that the equipment comprises locking means (15a₁,15a₂ or 15a₃,15a₄) between the first frame part (11) and the second frame part (12), by means of opening of which locking means the duct (12a) is made free from the space between the side walls (11a₁,11a₂) and the heat exchanger (13).

25

11. An intake air device as claimed in claim 9 or 10, **characterized** in that the equipment comprises hinge means (15a₁,15a₂ or 15a₃,15a₄), on whose support the duct (12a) can be displaced so that it is freed partly or completely from the space between the side walls (11a₁,11a₂) of the intake air device.

30

12. An intake air device as claimed in claim 9 or 10, **characterized** in that the locking means of the equipment, by whose means the duct (12a) has been attached to the rest of the construction, constitute at least a part of the hinge means (15a₁, 15a₂;15a₃,15a₄), that, thus, besides being articulation means, the hinge means
5 (15a₁,15a₂;15a₃,15a₄) are also locking means, and that the hinge means (15a₁,15a₂; 15a₃,15a₄) also comprise a pin (e), which operates, besides as a hinge pin, also as a locking pin.

13. An intake air device as claimed in any one of claims 9 to 12, **characterized** in
10 that the hinge pin (e), which also operates as a locking pin, has been fitted on a frame (R), which frame (R) is connected with the duct (12a), and that the hinge pin (e) has been fitted to move into a locking position and from it into a position that releases the locking against the spring force of a spring (J), and that, by means of the spring force of the spring (J), the hinge pin (e) is pressed into a position in which the
15 pin (e) is placed in a backup hole (m) in the end piece (14), and that the hinge comprises a lever (b), which is connected to the hinge pin (e), in which connection the locking can be opened when the hinge pin (e) is displaced, while the spring (J) is then compressed between the shifting pin (b) and the frame (R).

20 14. An intake air device as claimed in any one of claims 9 to 13, **characterized** in that the intake air device comprises an end piece (14a) at each end of the device, which end piece (14a) is preferably a box-like construction, which comprises an inlet opening (17b) in one side face for the air duct to be connected, and an opening (17a) in the other side face, which opening (17a) will be surrounded by an end seal (16)
25 provided at the end of the duct (12a), in which case there is a press fitting between the end seal (16) and the side face (14') of the end piece (14a) when the duct (17) is in the operating position while the end seal (16) surrounds the opening (17a) in the end piece (14a).



The
Patent
Office

4

Application No: GB 9804269.0
Claims searched: 1 & 9 at least

Examiner: Paul Gavin
Date of search: 30 April 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): F4V(VFYD,VFYM,VFYX)

Int Cl (Ed.6): F24F(13/072,26,30)

Other:

Documents considered to be relevant:

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|---|--------------------|
| X,E | GB 2 314 924 A (K.K. TOSHIBA) - whole document | 1 at least |
| X | GB 2 166 863 A (MITSUBISHI DENKI K.K.) - whole document | 1 at least |
| X | GB 2 155 616 A (MITSUBISHI DENKI K.K.) - whole document | 1 at least |
| X | GB 2 124 753 A (AURORA KONRAD G SCHULZ GMBH) - whole document | 1 at least |
| X | GB 1 555 563 (HOWORTH AIR ENG. LTD.) - whole document | 1 at least |
| X | EP 0 488 977 A2 (SOFT CONST. AB.) - whole document | 1 at least |

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.